

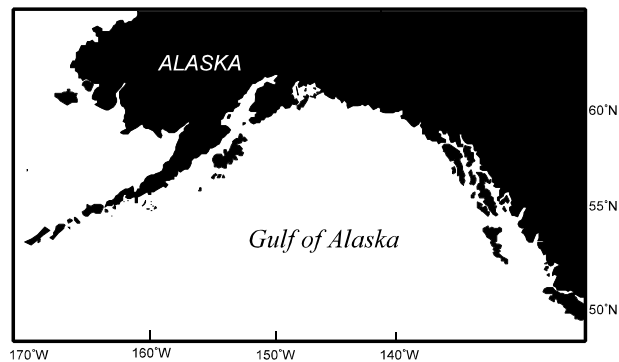
APPENDIX B

STOCK ASSESSMENT AND FISHERY EVALUATION REPORT

FOR THE GROUND FISH RESOURCES

OF THE GULF OF ALASKA

Compiled by



The Plan Team for the Groundfish Fisheries of the Gulf of Alaska

with contributions by

S. Barbeaux, J. Blackburn, E. Brown, C. Brylinsky, D. Carlile, D. Chen, D. Clausen, D. Courtney,
M. Dorn, J. Fujioka, S. Gaichas, M.A. Guttormsen, D. Hanselman, J. Heifetz, A. Hollowed, J. Ianelli,
S. Lowe, C. Lunsford, B. Megrey, V. O'Connell, M. Sigler, K. Spalinger, S. Stienessen, D. Stram,
G. Thompson, B. Turnock, T. Wilderbuer, G. Williams, C. Wilson, and H. Zenger

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North Pacific Fishery Management Council
605 W 4th Avenue, Suite 306
Anchorage, AK 99501

**Stock Assessment and Fishery Evaluation Report
for the Groundfish Resources
of the Gulf of Alaska
as Projected for 2003**

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SUMMARY

by

The Plan Team for the Groundfish Fisheries of the Gulf of Alaska

INTRODUCTION

The *National Standard Guidelines for Fishery Management Plans* published by the National Marine Fisheries Service (NMFS) require that a stock assessment and fishery evaluation (SAFE) report be prepared and reviewed annually for each fishery management plan (FMP). The SAFE reports are intended to summarize the best available scientific information concerning the past, present, and possible future condition of the stocks and fisheries under federal management. The FMPs for the groundfish fisheries managed by the Council require that drafts of the SAFE reports be produced each year in time for the October and December North Pacific Fishery Management Council (Council) meetings.

The SAFE report for the Gulf of Alaska (GOA) groundfish fisheries is compiled by the Plan Team for the Gulf of Alaska Groundfish FMP from chapters contributed by scientists at NMFS Alaska Fisheries Science Center (AFSC) and the Alaska Department of Fish and Game (ADF&G). The stock assessment section includes recommended acceptable biological catch (ABC) levels for each stock and stock complex managed under the FMP. The ABC recommendations, together with social and economic factors, are considered by the Council in determining total allowable catches (TACs) and other management strategies for the fisheries.

The GOA Groundfish Plan Team met in Seattle on November 12-15, 2002 to review the status of stocks of sixteen species or species groups that are managed under the FMP. The Plan Team review was based on presentations by ADF&G and NMFS AFSC scientists, and data from the 2001 GOA biennial trawl survey and the 2002 sablefish longline survey. Members of the Plan Team who compiled the SAFE report were Sandra Lowe, (chair), Diana Stram (plan coordinator), Jeff Fujioka, Dave Clausen (for Jon Heifetz), Jim Ianelli, Victoria O'Connell, Lew Haldorsen, Sarah Gaichas, Tom Pearson, Beth Sinclair, Farron Wallace, and Bill Bechtol.

The GOA FMP recognizes single species and species complex management strategies. Single species management is recommended for stocks that are easily targeted by the harvesting sector and for which minimal mixing of other species occurs in the targeted catch. In the Gulf of Alaska, Pacific cod, pollock, sablefish, Pacific ocean perch, thornyhead rockfish, flathead sole, rex sole, arrowtooth flounder, northern rockfish, and Atka mackerel are managed as single species. Other groundfish species that are usually caught in groups have been managed as complexes (also called assemblages). For example, shortraker and roughey rockfish, other slope rockfish, pelagic shelf rockfish, demersal shelf rockfish, deepwater flatfish, shallow water flatfish, and "other species" have been managed within complexes.

Fishermen do not catch species in a complex in proportion to the species composition, i.e., certain segments of the complex may be more easily harvested than others, or they may be more valuable. Consequently, the implicit risk in species complex management is that one or more of the species in the complex may be overharvested or underharvested. Recognition of this risk is important. Alternative management strategies can be imposed to limit this risk, including removing a species from a complex and managing as a single species, or reducing the quota of the complex to protect the more vulnerable species. The Plan Team gave close scrutiny to the species composition of the catch from the species complex management units and made recommendations for adjustments as required.

The FMP authorizes splitting species, or groups of species, from the complexes for purposes of promoting the goals and objectives of the FMP. Atka mackerel was split out from "other species" beginning in 1994. In 1998, black and blue rockfish were removed from the GOA FMP and management was deferred to ADF&G. Beginning in 1999, osmerids (eulachon, capelin and other smelts) were removed from the "other

species” category and placed in a separate forage fish category, along with other species found to be primary food sources for other marine animals.

Groundfish catches are managed against TAC specifications for EEZ and near coastal waters of the GOA. State of Alaska internal water groundfish populations are not surveyed by NMFS and catches from internal water fisheries should not be counted against the TAC. The Team has recommended that these catches represent unassessed fish, and should not be counted against an ABC or TAC. The Team noted that internal water bycatches of shortraker/roughey rockfish in Chatham Strait are counted against the Federal TAC and that this practice should not continue. The pollock assessment incorporated the ADF&G survey pollock biomass for 2002. The Plan Team acknowledged that it was appropriate to reduce the Western (W), Central (C) and West Yakutat (WY) combined GOA pollock ABC by the anticipated Prince William Sound (PWS) harvest level for the State fishery. Since the Team intends to annually include the State data and deduct the accompanying GHL, the Team deducted the 2003 PWS GHL of 1,700 mt from the W/C/WY pollock ABC before area apportionments were made.

The 2001 Gulf of Alaska bottom trawl survey did not sample the Eastern Gulf of Alaska management area (Areas 640 and 650). Each stock assessment estimated biomass from the eastern area based on one of the following approaches; past survey data was used to decide which of the two approaches was most appropriate for a given species:

- (1) Assume that year-to-year changes in Eastern Gulf biomass are related to changes in the Central Gulf. Multiply the 2001 survey estimate of biomass in the Central Gulf by the ratio of Eastern/Central biomass from past data to generate an estimate of 2001 biomass for the Eastern region.
- (2) Assume that, because of distribution or habitat differences, the species of interest has an Eastern region biomass that is independent of trends in the Central Gulf. In this case the most logical estimator of Eastern biomass is some average of Eastern region biomass from earlier surveys.

The Plan Team has provided EGOA subarea ABC recommendations on a case by case basis based on the following rationale since 1998. The Plan Team recommended splitting the EGOA ABC for species/complexes that would be disproportionately harvested from the West Yakutat area by trawl gear. The Team did not split EGOA ABCs for species that were prosecuted by multi-gear fisheries or harvested as bycatch. For those species where a subarea ABC split was deemed appropriate, two approaches were examined. The point estimate for WY biomass distribution based on survey results was recommended for seven species/complexes to determine the WY and East Yakutat/Southeast Outside subarea ABC splits. For three species/complexes, a range was recommended bounded by the point estimate and the upper end of the 95% confidence limit from all three surveys. The rationale for providing a range was based on a desire to incorporate the variance surrounding the distribution of biomass for those species/complexes that could potentially be constrained by the recommended ABC splits. The Team continues to support this rationale for determining 2003 ABCs. The Team presents both the point estimate and the upper 95% confidence limit, but based its 2003 recommendations on the upper 95% confidence limit.

NO SPLIT

Pacific cod
Atka mackerel
Shortraker/roughey
Thornyhead
Northern rockfish
Demersal shelf rockfish

SPLIT, POINT ESTIMATE

Deepwater flatfish
Shallowwater flatfish
Rex sole
Sablefish
Arrowtooth flounder
Flathead sole
Other slope rockfish
Pollock

SPLIT, UPPER 95% CL

Pacific ocean perch
Pelagic shelf rockfish

While ecosystem considerations are noted by the authors and Plan Team to accompany their recommendations of OFLs and ABCs, the stock assessments are based on a single stock or stock complex. An Ecosystem Chapter that annually collects summaries of ecosystem-related topics was initiated in 1995. In addition to the Ecosystem Chapter, each stock assessment will incorporate an Ecosystem Considerations section specific to their species/fishery.

Since the Stock Assessment and Fishery Evaluation Report (SAFE) for 2002 was issued (NPFMC 2001), the following new information has been incorporated in the stock assessments:

- (1) Pollock: a) 2000 catch at age; b) 2002 biomass and age composition from the Shelikof Strait EIT survey; c) 2001 age composition from the NMFS bottom trawl survey; d) 2002 biomass and length composition from the ADF&G crab/groundfish trawl survey; e) New maturity at age estimates using winter EIT survey specimen data, 1983-2002.
- (2) Pacific cod: a) Size composition data from the 2001 and January-August 2002 commercial fisheries were incorporated into the model;
- (3) Flatfish: Maturity at age information for Northern and Southern rocksole.
- (4) Arrowtooth flounder: a) Catch and fishery length data for 2001 were updated; b) 2002 catch and fishery length data were added to the model.
- (5) Sablefish: a) Relative abundance and length data from the 2002 longline survey; b) relative abundance and length data from the 2001 longline fishery; c) age data from the 2001 longline survey and longline fishery.
- (6) Slope rockfish: a) Northern rockfish fishery age compositions from 2000 and 2001; b) Northern rockfish fishery length compositions from 1999, 2000 and 2001.
- (7) Pelagic shelf rockfish: An appendix is included which discusses preliminary results of an age-structured model for Dusky Rockfish.
- (8) Demersal shelf rockfish: a) Updated yelloweye rockfish average weight and standard error data from 2001 port samples; b) updated estimates of yelloweye rockfish habitat; c) age composition data from the 2001 fishery; d) estimates of total mortality (Z) from a catch curve analysis.
- (9) Thornyheads: a) 2001 harvest levels by gear; b) relative population numbers from the 2002 sablefish longline survey.
- (10) Flathead sole: a) A separate assessment chapter for flathead sole is presented using an age-structured model; b) maturity at age and length data.
- (11) Atka mackerel: updated catch data.
- (12) Groundfish, generally: Updated harvest and discard data from the NMFS Observer Program and Regional Office for 2002.

BACKGROUND INFORMATION

Management Areas and Species

The Gulf of Alaska (GOA) management area lies within the 200-mile U.S. Exclusive Economic Zone (EEZ) of the United States (Figure 1). Five categories of finfishes and invertebrates have been designated for management purposes. They are, target species, other species, prohibited species, forage fish species and non-specified species. This SAFE report describes stock status of target species only. Species or complexes included in each of the first three categories are listed below.

<u>Target Species</u>	<u>Other Species</u>	<u>Prohibited Species</u>
Pollock	Octopus	Pacific halibut
Pacific cod	Squid	Pacific herring
Flounders	Sculpins	Pacific salmon
Rockfishes	Sharks	Steelhead trout
Sablefish	Skates	King crab
Atka mackerel		Tanner crab

No specifications are set for forage fish and catch records need not be kept. All other species of fish and invertebrates taken incidentally that are not managed by other FMPs and are associated with groundfish fisheries are designated as “non-specified species.” No specifications are set and catch records need not be kept. A species or species group from within the target species category may be split out and assigned an appropriate harvest level. Similarly, species in the target species category may be combined and a single harvest level assigned to the new aggregate species group. The harvest level for demersal shelf rockfish in the Eastern Regulatory Area is specified by the Council each year. However, management of this fishery is deferred to the State of Alaska with Council oversight.

Definition of Acceptable Biological Catch and the Overfishing Level

Amendment 56 to the GOA Groundfish FMP, approved by the Council in June 1998, defines ABC and OFL for the GOA groundfish fisheries. The new definitions are shown below, where the fishing mortality rate is denoted F , stock biomass (or spawning stock biomass, as appropriate) is denoted B , and the F and B levels corresponding to MSY are denoted F_{MSY} and B_{MSY} respectively.

Acceptable Biological Catch is a preliminary description of the acceptable harvest (or range of harvests) for a given stock or stock complex. Its derivation focuses on the status and dynamics of the stock, environmental conditions, other ecological factors, and prevailing technological characteristics of the fishery. The fishing mortality rate used to calculate ABC is capped as described under “overfishing” below.

Overfishing is defined as any amount of fishing in excess of a prescribed maximum allowable rate. This maximum allowable rate is prescribed through a set of six tiers which are listed below in descending order of preference, corresponding to descending order of information availability. The SSC will have final authority for determining whether a given item of information is reliable for the purpose of this definition, and may use either objective or subjective criteria in making such determinations. For tier (1), a pdf refers to a probability density function. For tiers (1-2), if a reliable pdf of B_{MSY} is available, the preferred point estimate of B_{MSY} is the geometric mean of its pdf. For tiers (1-5), if a reliable pdf of B is available, the preferred point estimate is the geometric mean of its pdf. For tiers (1-3), the coefficient a is set at a default value of 0.05, with the understanding that the SSC may establish a different value for a specific stock or stock complex as merited by the best available scientific information. For tiers (2-4), a designation of the form “ $F_{X\%}$ ” refers to the F associated with an equilibrium level of spawning per recruit (SPR) equal to $X\%$ of the equilibrium level of spawning per recruit in the absence of any fishing. If reliable information sufficient to characterize the entire maturity schedule of a species is not available, the SSC may choose to view SPR

calculations based on a knife-edge maturity assumption as reliable. For tier (3), the term $B_{40\%}$ refers to the long-term average biomass that would be expected under average recruitment and $F=F_{40\%}$.

Tier 1) *Information available: Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY} .*

1a) *Stock status: $B/B_{MSY} > 1$*

$F_{OFL} = m_A$, the arithmetic mean of the pdf

$F_{ABC} \leq m_H$, the harmonic mean of the pdf

1b) *Stock status: $a < B/B_{MSY} \leq 1$*

$F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$

$F_{ABC} \leq m_H \times (B/B_{MSY} - a)/(1 - a)$

1c) *Stock status: $B/B_{MSY} \leq a$*

$F_{OFL} = 0$

$F_{ABC} = 0$

2) *Information available: Reliable point estimates of B , B_{MSY} , F_{MSY} , $F_{35\%}$, and $F_{40\%}$.*

2a) *Stock status: $B/B_{MSY} > 1$*

$F_{OFL} = F_{MSY}$

$F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%})$

2b) *Stock status: $a < B/B_{MSY} \leq 1$*

$F_{OFL} = F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$

$F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - a)/(1 - a)$

2c) *Stock status: $B/B_{MSY} \leq a$*

$F_{OFL} = 0$

$F_{ABC} = 0$

3) *Information available: Reliable point estimates of B , $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.*

3a) *Stock status: $B/B_{40\%} > 1$*

$F_{OFL} = F_{35\%}$

$F_{ABC} \leq F_{40\%}$

3b) *Stock status: $a < B/B_{40\%} \leq 1$*

$F_{OFL} = F_{35\%} \times (B/B_{40\%} - a)/(1 - a)$

$F_{ABC} \leq F_{40\%} \times (B/B_{40\%} - a)/(1 - a)$

3c) *Stock status: $B/B_{40\%} \leq a$*

$F_{OFL} = 0$

$F_{ABC} = 0$

4) *Information available: Reliable point estimates of B , $F_{35\%}$, and $F_{40\%}$.*

$F_{OFL} = F_{35\%}$

$F_{ABC} \leq F_{40\%}$

5) *Information available: Reliable point estimates of B and natural mortality rate M .*

$F_{OFL} = M$

$F_{ABC} \leq 0.75 \times M$

6) *Information available: Reliable catch history from 1978 through 1995.*

OFL = the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information

$ABC \leq 0.75 \times OFL$

OVERVIEW OF STOCK ASSESSMENTS

The current status of individual groundfish stocks managed under the FMP are summarized in this section. The abundances of Pacific ocean perch, northern rockfish, thornyhead, flathead sole, and arrowtooth flounder are above target stock size. The abundances of pollock, Pacific cod, and sablefish are below target stock size. The relative abundances of deep-water flatfish, shallow-water flatfish, demersal shelf rockfish, pelagic shelf rockfish, other slope rockfish, and Atka mackerel are unknown.

Tables 1 and 2 provide a summary of the current status of the groundfish stocks, including catch statistics, ABCs, and TACs for 2002, and recommendations for ABCs and overfishing levels (OFLs) for 2003. Fishing mortality rates (F) and OFLs used to set these specifications are listed in Table 3. ABCs and TACs are specified for each of the Gulf of Alaska regulatory areas illustrated in Figure 1. Table 4 provides a list of species for which the ABC recommendations are below the maximum permissible. Table 5 provides historical groundfish catches in the GOA, 1956-2002.

The sum of the preliminary 2003 ABCs for target species is **414,840** mt, which is within the FMP-approved optimum yield (OY) of 116,000 - 800,000 mt for the Gulf of Alaska. The sum of 2003 OFLs is **531,440** mt. The Team notes that because of halibut bycatch mortality considerations in the high-biomass flatfish fisheries, an overall OY for 2003 will be considerably under this upper limit. For perspective, the sum of the 2002 TACs was **237,890** mt, and the sum of the ABCs was **394,780** mt.

The following conventions in this SAFE are used:

- (1) “Fishing mortality rate” refers to the full-selection F (i.e., the rate that applies to fish of fully selected sizes or ages). A full-selection F should be interpreted in the context of the selectivity schedule to which it applies.
- (2) For consistency and comparability, “exploitable biomass” refers to projected age+ biomass, which is the total biomass of all cohorts greater than or equal to some minimum age. The minimum age varies from species to species and generally corresponds to the age of recruitment listed in the stock assessment. Trawl survey data may be used as a proxy for age+ biomass. The minimum age (or size), and the source of the exploitable biomass values are defined in the summaries. These values of exploitable biomass may differ from listed in the corresponding stock assessments if the technical definition is used (which requires multiplying biomass at age by selectivity at age and summing over all ages). In those models assuming knife-edge recruitment, age+ biomass and the technical definitions of exploitable biomass are equivalent.
- (3) The values listed as 2001 and 2002 ABCs correspond to the values (in mt) approved by NMFS; some Council recommendations for 2001 were modified in the final rule for Steller Sea Lion Protection Measures. The values listed for 2003 correspond to the Plan Team recommendations.
- (4) The exploitable biomass for 2001 and 2002 that are reported in the following summaries were estimated by the assessment in those years. Comparisons of the 2003 biomass with previous years’ levels should be made with biomass levels from the revised hindcast reported in each assessment.

POLLOCK

	ABC		EXPLOITABLE ¹		
	<u>W/C/WYK</u>	<u>EYK/SEO</u>	<u>TOTAL</u>	<u>BIOMASS</u>	<u>CATCH</u>
2001	99,350	6,460	105,810	699,000	72,076
2002	51,790 ³	6,460	58,250	726,600	50,390 ²
2003	47,890 ³	6,460	54,350	699,120	

1/ Age 3+ biomass.

2/ Catch through November 2, 2002.

3/ The 2002 ABC is reduced by 1,700 mt to accommodate the Prince William Sound GHL.

The age-structured assessment model using ADModel Builder (a C++ software language extension and automatic differentiation library) for assessments since 1999 is unchanged. Model exploration focused on approaches to modeling survey time series, particularly the winter EIT surveys.

Relative to the 2001 SAFE, new sources of information include: (1) total catch and age composition from the 2001 fishery; (2) biomass and age composition from the 2002 Shelikof Strait echo integration trawl (EIT) survey; (3) biomass and age composition from the 2002 ADF&G coastal trawl survey; (4) age composition for the 2001 NMFS bottom trawl survey; and (5) new maturity-at-age estimates using winter EIT survey data for 1983-2002.

Spawning stock estimates for 2003 strongly depend on the magnitude of the 1999 year class. The 2002 model estimate indicates the 1999 year class is 2.7 times larger than mean recruitment during 1979-2000. However, this year's assessment indicates that the 1999 year class was about 30% less than projected by the 2001 model (although precision has improved). The 2002 Shelikof Strait EIT survey estimate of spawning biomass is 38% lower than the 2001 survey, with a much greater decrease in biomass of pollock ≥ 43 cm. In contrast, the Shelikof Strait EIT survey estimate of age-3 abundance was the third highest on record. Also, pollock biomass estimated by the 2002 ADF&G trawl survey increased 11% from the 2001 survey.

The stock assessment authors presented six models: model 1 estimated q instead of fixing $q=1.0$ as in other models; model 2 was similar to last year's assessment; model 3 excluded the 2002 Shelikof EIT data; model 4 excluded all Shelikof survey time series data; model 5 adjusted the 2002 EIT survey biomass distribution to historical averages; and model 6 excluded the ADF&G 2002 trawl survey data. The Plan Team concurred with the assessment authors that model 2 provided the best use of available data and maintained consistency with previous assessments. The estimated spawning biomass in 2003 is 177,070 mt and below the $B_{40\%}$ value of 240,190 mt. This places Gulf of Alaska pollock in Tier 3b. The author presented analyses on the sensitivity of ABC recommendations to assumptions about the strength of the 1999 year class. The projected 2003 age-3+ biomass estimate is 670,410, assuming average abundance for the 1999 year class, for the Western, Central, and West Yakutat areas and 28,170 mt for the East Yakutat and Southeast Outside areas.

The Plan Team notes that there is substantial uncertainty around the strength of the 1999 year class, but a suite of new information will be available in 2003 from sources including: the NMFS biennial bottom trawl survey; the Shelikof EIT survey; a gulf wide summer acoustic survey; and additional fishery age and size data. We agree with the authors that a downward adjustment to the maximum permissible ABC is warranted because of assessment uncertainty and the current stock status, and we support the authors' ABC recommendation.

The 2003 ABC recommendation for pollock in the Gulf of Alaska west of 140° W long. is 49,590 mt ($F_{ABC} = 0.24$), a decrease of 35% from the last year's projected maximum permissible ABC for 2002. Elements of risk-aversion in the recommendation include: (1) fixing trawl catchability at 1.0; (2) assuming an average 1999 year class; and (3) not adjusting the 2002 Shelikof Strait biomass estimates to account for a lower than anticipated portion of the spawning stock in 2002. The 2003 overfishing level is 69,410 mt ($F_{OFL} = 0.35$). The 2003 recommended ABC for the Western, Central and West Yakutat area is 47,890 mt after being

reduced to accommodate the 2003 Prince William Sound guideline harvest level of 1,700 mt. The West Yakutat ABC is calculated as an annual allocation of 1,078 mt, resulting in an ABC of 46,812 for the Western and Central Areas.

Due to the lack of new survey data in the EGOA, the 2003 ABC recommendation for pollock in southeast Alaska (East Yakutat and Southeastern areas) is unchanged at 6,460 mt. The 2003 southeast OFL is also unchanged at 8,610 mt.

Steller Sea lion Protection Measures require apportionment of pollock among Gulf of Alaska management areas based on the seasonal distribution of biomass. The assessment used available data from a composite of winter surveys to apportion pollock in the A and B seasons and the summer bottom trawl surveys to apportion pollock in the C and D seasons. The Plan Team concurs with the authors' recommendations to apportion areas 620 and 630 in the A season as the midpoint between the winter and summer distribution. The recommended apportionment of the 2003 ABC of 47,890 mt for the Western, Central and West Yakutat areas is shown below. The Plan Team also concurred with the author's recommendation that overages or underages from a seasonal apportionment be added or subtracted to subsequent seasonal allowances, provided that seasonal allocations do not exceed 30% of the total TAC.

Season	Area				Total
	Shumagin (610)	Chirikof (620)	Kodiak (630)	West Yakutat (640)	
A	2,894	6,535	2,274		11,703
B	2,894	7,778	1,031		11,703
C	5,500	2,686	3,517		11,703
D	5,500	2,686	3,517		11,703
Total	16,788	19,685	10,339	1,078	47,890

PACIFIC COD

YEAR	ABC	EXPLOITABLE	
		BIOMASS ¹	CATCH ²
2001	67,800	468,000	41,613
2002	57,600	428,000	40,524 ³
2003	52,800	452,000	

1/ Age 3+ biomass

2/ Includes State management fisheries.

3/ Catch through November 2, 2002.

Size composition data from the 2001 and January-August 2002 commercial fisheries were incorporated into the model. This year's model was modified to estimate separate selectivity schedules for the intervals 1978-1986, 1987-1999, and 2000-present. In previous assessments only two intervals were estimated: 1978-1986, and 1987-present.

The Bayesian meta-analysis, which has formed the basis for a risk-averse ABC recommendation in the 1996-1999 assessments, was not performed for the present assessment. Similar to last year's approach, the ratio (0.87) between the recommended F_{ABC} and $F_{40\%}$ estimate given in the 1999 assessment was assumed to be an appropriate factor by which to multiply the 2003 maximum permissible F_{ABC} to obtain a recommended 2003 F_{ABC} .

The estimated 2003 spawning biomass for the GOA stock is 88,300 mt, up about 8% from last year's

estimate for 2002. Pacific cod are in Tier 3b, as the $B_{40\%}$ reference level is estimated to be 90,300 mt. The estimated 2003 total age 3+ biomass for the GOA stock is 452,000 mt.

The Plan Team concurs with the author's recommended 2003 ABC of 52,800 mt, which is down about 8% from last year's recommendation for 2002. The 2003 OFL for the GOA stock is 70,100 mt.

For the 2002 fishery, allocation of ABC among regulatory areas followed the average biomass distribution estimated by the three most recent (1996, 1999, and 2001) trawl surveys, giving the following apportionment: Western-39%, Central-55%, and Eastern-6%. Assuming that this apportionment is retained for the 2003 fishery, the recommended ABC would be allocated as follows: Western-20,600 mt, Central-29,000 mt, and Eastern-3,200 mt.

FLATFISH

		EXPLOITABLE	
<u>2001</u>	<u>ABC</u>	<u>BIOMASS</u>	<u>CATCH</u>
Deep water	5,300	74,460	804
Rex sole	9,440	74,600	2,940
Shallow water	37,860	299,100	6,162
Flathead sole	<u>26,270</u>	<u>207,520</u>	<u>1,911</u>
TOTAL	78,870	655,680	11,817

		EXPLOITABLE	
<u>2002</u>	<u>ABC</u>	<u>BIOMASS</u>	<u>CATCH</u> ¹
Deep water	4,880	68,263	558
Rex sole	9,470	71,326	3,009
Shallow water	49,550	349,992	6,842
Flathead sole	<u>22,690</u>	<u>170,915</u>	<u>2,108</u>
TOTAL	86,590	660,496	12,517

		EXPLOITABLE
<u>2003</u>	<u>ABC</u>	<u>BIOMASS</u>
Deep water	4,880	68,263
Rex sole	9,470	71,326
Shallow water	49,340	349,992
TOTAL	63,270	489,581

¹2002 catch through November 2

The flatfish group is subdivided into deep water flatfish, rex sole, flathead sole, and shallow water flatfish. Flathead sole is presented in a separate assessment. The 2003 exploitable biomass for each group is based on results from the 2001 NMFS trawl survey. However, the lack of survey effort in 2001 in the eastern GOA resulted in biomass in the eastern GOA being approximated by using the average of the 1993-1999 eastern GOA biomass estimates. In addition, biomass estimates for some species were also affected by the lack of sampling deeper than 500 m. The 500-1,000 m depth strata not sampled in 2001 is generally outside the depth range of most flatfish species, with the exception of Dover sole, Greenland turbot, deep-sea sole and, to a lesser extent, rex sole.

ABC and OFL were calculated by species, with individual species identified as tier 4, 5, or 6 depending upon the available data. The total flatfish ABC for 2003 decreased slightly from 2002 because maturity data for northern and southern rock sole allowed estimation of F40% and F35% and resultant ABCs for those species declined. Otherwise, ABCs remained the same as 2002.

Apportioning ABCs among the regulatory areas in proportion to biomass distributions in the 2001 trawl survey results in the area apportionments listed below. As in 2002, the Team recommends splitting the eastern GOA ABC between the WY and EYAK/SEO subareas. The resulting 2003 ABCs are:

	<u>WESTERN</u>	<u>CENTRAL</u>	<u>WYAK</u>	<u>EYAK/SEO</u>	<u>TOTAL</u>
Deep water	180	2,220	1,330	1,150	4,880
Rex sole	1,280	5,540	1,600	1,050	9,470
Shallow water	23,480	21,740	1,160	2,960	49,340

The overfishing levels for the flatfish groups are determined by the fishing mortality rates based on the tier structure of the exploitable biomass estimates. Those fishing mortality rates and associated catch levels are:

	<u>F_{ABC}</u>	<u>F_{OFL}</u>	<u>LEVEL</u>	<u>TIER</u>
Deep water	0.075	0.10	6,430	5,6
Rex sole	0.15	0.20	12,320	5
Shallow water	0.15-0.2	0.192-.245	61,810	4,5

ARROWTOOTH FLOUNDER

<u>YEAR</u>	<u>ABC</u>	<u>EXPLOITABLE BIOMASS</u>	<u>CATCH</u> ¹
2001	148,150	1,586,530	19,964
2002	146,260	1,760,000	20,941
2003	155,140	1,302,000	

¹Catch for 2002 through November 2

The 2003 exploitable biomass of 1,302,000 mt is based on abundance estimates derived from an age-structured model developed with AD Model Builder software. Similar to the previous assessment, the model accommodated a higher proportion of females in the larger size intervals of both survey and fishery data by giving males a higher mortality rate than females. The only change from last year's model was that the survey selectivity was fit using a two parameter logistic model as opposed to a smoothed curve fit used in prior models. ABC was determined based on Tier 3a calculations ($F_{40\%} = 0.14$). The overfishing level was determined to be 181,390 mt ($F_{35\%} = 0.165$). The Team recommended that ABC be apportioned among regulatory areas in proportion to biomass distributions in the 2001 trawl survey. The resulting ABCs are:

<u>WESTERN</u>	<u>CENTRAL</u>	<u>WYAK</u>	<u>EYAK/SEO</u>	<u>TOTAL</u>
17,990	113,050	18,190	5,910	155,140

FLATHEAD SOLE

<u>YEAR</u>	<u>ABC</u>	<u>EXPLOITABLE BIOMASS</u>	<u>CATCH</u> ¹
2001	26,270	207,520	1,910
2002	22,690	170,915	2,108
2003	41,390	132,260	

¹2001 catch through November 2, 2002.

This year an age structured model was run for flathead sole. Previously flathead sole had been included in the Flatfish Complex. The 2003 exploitable biomass of 132,264 mt is based on abundance estimates derived from an age-structured model developed with AD Model Builder software. Analysis of maturity by age and length was completed for Gulf of Alaska flathead sole and these data included in the model. Age data from

the trawl survey for 1984, 1993, and 1996 were used as well as length data from the trawl survey (1987, 1990, 1999, 2001) and the commercial fishery (1985-2002). The reference rates for flathead were much higher than in the past, because of the updated information on length and age at maturity. Age at 50% maturity is estimated to be 8 years while age at 50% selectivity is estimated to be 10 years. Projected spawning biomass is 93,524 mt, above the $B_{40\%}$ biomass of 38,163 mt; therefore flathead sole is in tier 3a. $F_{40\%}$ was 0.417, resulting in an ABC of 41,402 mt. The overfishing level, $F_{35\%} = 0.546$, is 51,556 mt. Apportionment of the ABC was based on the fraction of the 2001 survey biomass in each area:

<u>Western</u>	<u>Central</u>	<u>West Yakutat</u>	<u>East Yakutat/SE</u>	<u>Total</u>
16,420	20,820	2,900	1,250	41,390

SABLEFISH

<u>YEAR</u>	<u>ABC</u>	<u>EXPLOITABLE BIOMASS</u>	<u>CATCH</u> ¹
2001	12,840	188,000	12,047
2002	12,820	188,000	12,246
2003	13,110	182,000	

¹ Catch through November 2, 2002.

The survey abundance index increased 5% in number and 7% in weight from 2001 to 2002. Fishery abundance data for 2002 were not analyzed because the fishery remains open. Exploitable and spawning biomass are projected to increase 6 and 3%, respectively, from 2002 to 2003. Alaska sablefish abundance now appears moderate and increased from recent lows. Projected 2003 spawning biomass is 39% of unfished spawning biomass, having been as low as 35% during 1998 to 2000. The increase confirms the projection from last year's assessment that abundance would increase due to the above average 1997 year class. The 1997 year class is an important part of the total biomass and is projected to account for 24% of 2003 spawning biomass. There are also indications that the 1998 year class is above average. Whether sablefish abundance falls after the 2003 peak depends on the actual strength of the 1998 year class.

The maximum permissible yield from an adjusted $F_{40\%}$ strategy is 25,400 mt. The authors' recommended a 2003 ABC of 18,400 mt for the GOA/BSAI stock. This yield gave a low probability of reducing spawning biomass below the historic low, assuming constant catch over 5 years. The Plan Team felt that computing probabilities using a constant catch scenario was unrealistic. However, the Team considered it prudent to set ABC below the maximum permissible. The Plan Team was uncomfortable with such a large increase in catch, and felt that the ABC should be scaled closer to the observed biomass increase as an added precaution. This was similar to the author's recommended ABC.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of Amendment 56 to the BSAI/GOA Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 216,000 t (combined across the EBS, AI, and GOA), 0.133, and 0.164, respectively. Projected spawning biomass (combined areas) for 2003 is 210,000 t, placing sablefish in sub-tier "b" of Tier 3. The maximum permissible value of F_{ABC} under Tier 3b is 0.129, which translates into a 2003 catch (combined areas) of 25,400 t, which would be the maximum permissible ABC under Amendment 56. The Plan Team's recommended 2003 ABC is 18,400 mt and corresponds to $F = 0.081$. A 5-year exponential weighting of longline survey relative abundance was used to apportion the combined 2003 ABC among regions, resulting

in the following values: EBS–2,550 t, AI–2,740 t, and GOA–13,110 t.

The OFL fishing mortality rate is 0.159, which translates into a 2003 OFL (BSAI, GOA combined) of 30,900 t. Using the survey-based apportionment scheme described above, 2003 OFL was apportioned among regions and results in the following values: EBS–4,290 t, AI–4,590 t, and GOA–22,020 t.

Further apportionment within the GOA areas gives (this includes the reallocation of 5% of the Southeast Outside quota to the West Yakutat area for trawlers):

Western:	2,260
Central:	5,670
West Yakutat:	2,045
Southeast Outside:	<u>3,135</u>
Total:	13,110

SLOPE ROCKFISH

		ABC	EXPLOITABLE BIOMASS	CATCH ¹
2001	Pacific ocean perch	13,510	211,160	10,817
	shortraker/rougheye	1,730	70,890	1,976
	northern rockfish	4,880	93,850	3,127
	other slope rockfish	<u>4,900</u>	<u>102,510</u>	<u>559</u>
	TOTAL	25,020	478,410	16,642
2002	Pacific ocean perch	13,190	293,240	11,735
	shortraker/rougheye	1,620	66,830	1,391
	northern rockfish	4,980	94,350	3,335
	other slope rockfish	<u>5,040</u>	<u>107,960</u>	<u>771</u>
	TOTAL	24,830	562,380	17,232
2003	Pacific ocean perch	13,660	298,820	
	shortraker/rougheye	1,620	66,830	
	northern rockfish	5,540	108,830	
	other slope rockfish	5,040	107,960	
	TOTAL	25,860	582,440	

1/ Catch through November 2, 2002.

PACIFIC OCEAN PERCH

The model for Pacific ocean perch is a template developed in a modeling workshop at the Auke Bay Laboratory in Feb. 2001. This model, constructed with AD model builder software, was first used in last year's SAFE report. In previous years, the stock assessment for Pacific ocean perch was based an age-structured model using stock synthesis. The rockfish model template is a simple age-structured model with allowance for size composition data that is adaptable to several rockfish species. Both survey and fishery selectivity patterns are assumed to be constant over time. New data in this year's assessment included the catch for 2002 and age distributions from the 2001 fishery.

In this year's assessment, four different model configurations were evaluated: a base model, and three alternatives. For the base model, survey and fishery selectivity patterns were assumed to be asymptotic and

all likelihood components were given an emphasis weight of 1. The one exception was catch, which was given a weight of 50 in all model runs. For the three other model configurations, various likelihood components were modified in their weighting. ABCs from the four models ranged from 9,980 mt to 17,300 mt. The authors recommended that the ABC from the base model, 13,660 mt, be used for the 2003 fishery. This ABC is a 4% increase from the 2002 fishery ABC of 13,190 mt.

Tier 3a is used to compute ABC and OFL for Pacific ocean perch. The 2003 female spawning biomass of 112,270 mt is greater than $B_{40\%}$ (104,820 mt), where $B_{40\%}$ is determined from the average recruitment of the 1977-93 year classes. The estimate of $F_{40\%}$ is 0.050. According to the definition for Tier 3a, F_{ABC} is ≤ 0.050 , so that $ABC \leq 13,660$ mt. The Plan Team concurred that the 2003 ABC for Pacific ocean perch be set at 13,660 mt. The OFL ($F_{35\%} = 0.060$) is 16,240 mt.

The Team and authors also concurred with the method of ABC apportionment used in the past. This results in weighting of 4:6:9 for biomass in the 1996, and 1999, and 2001 surveys, respectively, and area apportionments of 19.8% for the Western area, 62.3% for the Central area, and 17.9% for the Eastern area. Therefore, recommended ABCs for 2003 are 2,700 mt for the Western area, 8,510 mt for the Central area, and 2,450 mt for the Eastern area. Using the same apportionment produces OFLs of 3,220 mt in the Western area, 10,120 mt in the Central area, and 2,900 mt in the Eastern area.

Amendment 41 prohibited trawling in the Eastern area east of 140° W longitude. Since Pacific ocean perch are caught exclusively with trawl gear, there is concern that the entire Eastern area TAC not be taken in the area between 140° and 147° W longitude, that remains open to trawling. Thus, as was done last year, the Team recommends that a separate ABC be set for Pacific ocean perch in WYAK. The weighted average method described above results in a point estimate of 0.22 for the proportion of the exploitable biomass in the Eastern area that occurs in WYAK. However, there is considerable uncertainty in this estimate. In an effort to balance this uncertainty with associated costs to the industry, the Team recommends that apportionments to WYAK be based proportionately on the upper 95% confidence limit of 0.33. This corresponds to an ABC of 810 mt for WYAK. Under this apportionment strategy, very little of the 1,640 mt assigned to the remaining Eastern area (East Yakutat/Southeast Outside area) is expected to be harvested.

The assessment also included an analysis by one of the authors of a preliminary evaluation of model uncertainties. Previous model runs were based on a fixed natural mortality (M) of 0.05 and constraining catchability (q) to a value near 1. Exploration of these parameters was performed by loosening the constraint on q and estimating M . These exploratory runs generally resulted in lower estimates of ABC than those in the original model configurations. This does not necessarily imply that the base model and its alternatives are overestimating ABC, but it does suggest that caution is needed until uncertainties are quantified. The Plan Team recommends that the authors continue this investigation of model uncertainties for next year's assessment.

SHORTRAKER/ROUGHEYE

The assessment for shortraker/rougheye is unchanged from the Nov. 2001 SAFE report. The average of the exploitable biomasses in the three most recent trawl surveys (1996, 1999, and 2001) is used to determine current exploitable biomass. The current estimates of exploitable biomass are 25,470 mt for shortraker rockfish and 41,360 mt for rougheye rockfish. Applying the definitions for ABC and OFL places shortraker rockfish in Tier 5 where $F_{ABC} \leq 0.75M$. Thus, the recommended F_{ABC} for shortraker rockfish is 0.023 (i.e., 0.75×0.03). Applying Tier 4 to rougheye rockfish (i.e., $F_{ABC} \leq F_{40\%}$) allows an $F_{ABC} = M = 0.025$ which is less than $F_{40\%} = 0.032$. Applying these F_{ABC} rates to the estimates of exploitable biomass results in ABCs of 586 mt for shortraker rockfish and 1,034 mt for rougheye rockfish and a total ABC for the subgroup of 1,620 mt. Overfishing is defined to occur at the harvest rate set equal to $F_{35\%}$ of 0.038 for rougheye rockfish and at the $F = M$ rate of 0.030 for shortraker rockfish because data are not available to determine $F_{35\%}$ for shortraker rockfish. These harvest rates are applied to estimates of current exploitable biomass to yield an

overfishing catch limit of 2,340 mt for the shortraker/rougheye assemblage.

As in last year's assessment, the Team recommends that the same ABC apportionment methodology used for Pacific ocean perch be applied to shortraker and rougheye rockfish. This method results in ABCs of 220 mt for the Western area, 840 mt for the Central area and 560 mt for the Eastern area. The Team did not split the Eastern area ABC into subareas defined by the 140° W longitude boundary in Amendment 41 because this bycatch-only fishery is harvested by both longline and trawl gear.

NORTHERN ROCKFISH

As was done last year, the stock assessment for northern rockfish was based on an age-structured model constructed using AD Model Builder software. New data added for this assessment included updated fishery catch from 2001, preliminary fishery catch from 2002, fishery age compositions from 2000 and 2001, and fishery length compositions from 1999 through 2001.

Two variations of the northern rockfish model were evaluated for this year's assessment. The first variation (model 1) is the base model from last year's assessment. The second variation (model 2) represents changes made to the base model during development of an age-structured rockfish model template. The differences in the models are reformulations of how specific parameters are estimated. Reformulation of survey catchability and selectivity affected results. More exploratory model runs are needed before model 2 can be used for northern rockfish ABC calculations. Consequently, model 1 was recommended for this year's assessment.

Tier 3a is used to compute ABC and OFL. Current female spawning biomass ($B_{2003} = 42,743$ mt) is greater than $B_{40\%}$ (25,268 mt), where $B_{40\%}$ is determined from the average recruitment of the 1977-94 year classes. The current estimate of $F_{40\%}$ is 0.056. Applying Tier 3a results in $F_{ABC} \leq 0.056$ and an $ABC \leq 5,540$ mt. The authors and Plan Team recommended that the ABC for northern rockfish for the 2003 fishery in the Gulf of Alaska be set at 5,540 mt. The overfishing level based on Tier 3a ($F_{35\%} = 0.066$) is 6,565 mt. In view of recent weak recruitment estimates, harvest projections are likely to decline in the near term.

Apportioning the ABC based on the same method used for Pacific ocean perch results in ABCs of 890 mt in the Western area and 4,640 mt in the Central area, and 10 mt in the Eastern area. Northern rockfish are combined with other slope rockfish in the Eastern area.

OTHER SLOPE ROCKFISH

The assessment for other slope rockfish is unchanged from the Nov. 2001 SAFE report. Exploitable biomass is determined from the average of the three most recent trawl surveys in 1996, 1999, and 2001. Applying the definitions for ABC and OFL places sharpchin rockfish in Tier 4 where $F_{ABC} \leq F_{40\%}$, and the other species of other slope rockfish in Tier 5 where $F_{ABC} \leq 0.75M$. For sharpchin rockfish, the recommended F_{ABC} is $F = M = 0.05$ which is less than the maximum allowable $F_{40\%} = 0.055$. For the other species, the recommended F_{ABC} is 0.75M. This results in a recommended combined ABC for other slope rockfish of 5,040 mt. Apportioning this ABC based on the same method used for Pacific ocean perch results in ABCs of 90 mt in the Western area, 550 mt in the Central area, and 4,400 mt in the Eastern area. Overfishing is defined as $F_{35\%} = 0.064$ for sharpchin rockfish and $F = M$ for the other species. This results in an OFL of 6,610 mt.

The Team recommended that a separate ABC be set for other slope rockfish in the WYAK area. Using the same weighted average method as used for Pacific ocean perch results in a point estimate of 0.06 for the proportion of the exploitable biomass in the Eastern area that occurs in WYAK. Because a small portion of the Eastern ABC of other slope rockfish has been taken recently and some of these fish are caught with longline gear, the Team recommended that this point estimate be used to apportion the ABC. This corresponds to an ABC of 260 mt in West Yakutat and 4,140 mt in the remaining Eastern area.

The Plan Team also strongly encouraged the authors of the Slope Rockfish Report to divide the document into three separate reports for next year's assessment 2003: 1) Pacific ocean perch; 2) northern rockfish; and 3) shortraker/rougheye and other slope rockfish. The team and other attendees at the meeting noted that the present report is becoming unwieldy, and would be much easier to read if divided into three smaller reports.

Summary of 2003 ABC Recommendations for Slope Rockfish

	Western	Central	Eastern	West Yakutat	EYAK/SE	Total
Pacific ocean perch	2,700	8,510		810	2,900	13,660
Northern rockfish	890	4,640				5,530
Shortraker/rougheye	220	840	560			1,620
Other slope rockfish	90	550		270	4,140	5,050 ¹

1. The EGOA ABC of 10 mt for northern rockfish has been included in the WYAK ABC for Other Slope rockfish

PELAGIC SHELF ROCKFISH

	EXPLOITABLE		
<u>YEAR</u>	<u>ABC</u>	<u>BIOMASS</u>	<u>CATCH</u>
2001	5,980	66,440	3,008
2002	5,490	62,489	3,318 ¹
2003	5,490	62,489	

1/ Catch through November 2, 2002.

This year's assessment is unchanged from the November SAFE report due to the lack of new assessment data.

The pelagic shelf rockfish (PSR) assemblage is comprised of dusky, yellowtail, and widow rockfishes. Biomass estimates for PSR indicate that dusky rockfish comprise nearly all the biomass. Based on mean trawl survey data in 1996, 1999, and 2001, the 2003 exploitable biomass was calculated to be 62,489 mt. An F=M strategy equal to 0.09 for dusky rockfish resulted in an ABC of 5,490 mt for the assemblage. This strategy is more conservative than the Tier 4 maximum $F_{40\%}$ of 0.11 and the Team feels a reduction is justified due to concern over the reliability of biomass estimates for this assemblage. Given the rationale described for Pacific ocean perch, a respective weighting of 4:6:9 applied to PSR geographical distributions from the 1996, 1999, and 2001 surveys, results in ABC apportionment of 510 mt to the Western, 3,480 mt to the Central, and 1,500 mt to the Eastern areas.

The Team was presented an age structured model constructed with AD Model Builder software for dusky rockfish. This model represented a "working" model that provided reasonable fits to the data. The Team encourages the authors to continue development and refinement of an age structured assessment for dusky rockfish. Natural mortality, catchability and selectivity are key parameters and their relationship should be fully investigated.

The Team recommends that the Eastern area ABC be apportioned to West Yakutat according to the upper 95% confidence limit estimate of proportion in West Yakutat from the three most recent survey years with

total Eastern area ABC not to exceed 1,500 mt. Point estimates for West Yakutat and SEO are 640 and 860 respectively. The point estimate of F_{OFL} under the Amendment 56 overfishing definitions is $F_{35\%}$ (0.136) producing a gulfwide overfishing level of 8,216 mt.

<u>Western</u>	<u>Central</u>	<u>West Yakutat</u>	<u>SEO</u>	<u>Total</u>
510	3,480	640	860	5,490

DEMERSAL SHELF ROCKFISH

EXPLOITABLE

<u>YEAR</u>	<u>ABC</u>	<u>BIOMASS</u>	<u>CATCH</u>
2001	330	14,695	326
2002	350	15,615	188 ¹
2003	390	17,510	

1/ Catch through November 02, 2002.

Demersal Shelf Rockfish (DSR) is comprised of seven species of rockfishes, of which yelloweye is the commercial fishery target species. A submersible is used to conduct line transects to estimate yelloweye density. Adult yelloweye biomass is estimated for each management area as the product of density, mean weight, and area estimates of DSR habitat. The sum of the lower 90% CI (log-based) for each area is used as the best estimate of biomass because the fish are assessed on an area-specific basis for both density and weight.

Revisions to the DSR stock assessment from last year include: 2001 average weight data and associated standard error; 2001 fishery age data; updated catch data; and changes to the approach used for definition of habitat area. Multibeam data (694 km² of seafloor) collected in 2001 were analyzed for habitat characterization. In areas that have not been surveyed using multibeam, sidescan, or submersible surveys, commercial logbook data is used to define area of yelloweye habitat. Two new areas were also surveyed using multibeam. All logbook data from the directed DSR fishery between 1997-2001 that had a catch per unit effort of at least 0.04 yelloweye/hook were used. Start locations of sets, buffered to 0.05 nm, were mapped and the resulting polygons used to define area of habitat. This resulted in an increase of 280 km². The 2003 exploitable biomass estimate for yelloweye rockfish in Southeast/East Yakutat, is 17,510 mt. This is an increase of 10% over last year. Using tier 4 and adjusting for the 10% of other species landed in the assemblage, the F_{ABC} was set at $F=M=0.02$, yielding an ABC of 390 mt. This is more conservative than the $F_{40\%}$ level. The overfishing level was set at $F_{35\%}=0.0279 = 540$ mt.

The Plan Team encourages the Regional NMFS to move forward with the DSR full retention amendment, the intent of which is to provide managers with better total bycatch data. It is currently difficult to estimate DSR mortality associated with the halibut fishery. IPHC survey data indicates that there is not a linear relationship between amount of halibut caught and amount of DSR bycatch. In 2003, the directed fishery for DSR in East Yakutat will be preempted by the halibut fishery.

THORNYHEAD ROCKFISH

<u>YEAR</u>	<u>ABC</u>	<u>EXPLOITABLE BIOMASS</u>	<u>CATCH</u> ¹
2001	2,310	52,100	1,339
2002	1,990	77,840	1,125
2003	2,000	75,896	

¹ Catch through November 2, 2002.

The updated model incorporated new catch data and relative population numbers from the 2002 sablefish longline survey. The current assessment extended last year's investigation of alternative values of natural mortality and length at age. Based on an evaluation on how alternatives fit the data the authors selected the baseline model configuration. However, this model resulted in natural mortality that seems high to the Plan Team.

The Plan Team supported the base model's configuration and advised continued use of the model with additional investigation of selectivity assumptions and prior distributions for natural mortality. The Plan Team used the base model to obtain reference levels, however, they felt an adjustment to the maximum permissible ABC was warranted due to uncertainty in life history parameters, insufficient catch at length sampling from the longline fishery, and uncertainties associated with the incomplete depth and area coverage of the 2001 GOA trawl survey. The Plan Team recommends further model development and data evaluation, including consulting with the Observer Program to see if it is possible to improve longline fishery length sampling without compromising other data collection priorities. The Plan Team also encourages a full survey of the GOA in 2003 including deep strata and the Eastern Gulf to better assess thornyhead biomass and bathymetric demography.

The Plan Team recommends an ABC of 2,000 mt which is the yield in the current assessment from an alternative model. This alternative model was used to set the 2002 ABC and assumed a fixed value of M of 0.038. The recommended ABC of 2,000 mt is associated with an $F = 0.067$ and is lower than the maximum permissible ABC of 2,555 mt ($F = 0.085$) from the base model. The projected 2003 female spawning biomass is 22,800 mt which is above the $B_{40\%}$ estimate of 15,800 mt, thus thornyhead rockfish are in tier 3a. The area apportionments of the recommended ABC are: Western - 360 mt, Central - 840 mt, and Eastern 800 mt. The $F_{35\%}$ value is 0.102 and the OFL is 3,050 mt (base model).

ATKA MACKEREL

<u>YEAR</u>	<u>ABC</u>	<u>CATCH</u>
2001	600	76
2002	600	84 ¹
2003	600	

¹ Catch through November 2, 2002.

Prior to 1997, exploitable biomass and ABC for Atka mackerel were based on triennial bottom trawl survey estimates. However, schooling behavior, patchy distribution, and habitat preference makes this species difficult to sample with standard trawl survey gear. Atka mackerel are also poor targets for hydroacoustic surveys because they lack swim bladders. Re-evaluation of historical survey data indicated abundance estimates prior to 1997 were also compromised by high variability. Thus, existing GOA bottom trawl survey data has limited utility for either absolute abundance estimates or indices for Atka mackerel.

The Plan Team supports a bycatch-only fishery as a conservative harvest policy for Atka mackerel because: (1) there is no reliable biomass estimate; (2) localized depletion may occur; and (3) this species has previously exhibited a particular vulnerability to fishing pressure in the GOA. The Team recommends an ABC of 600 mt in 2003 to satisfy bycatch needs in other fisheries. Under Tier 6 criteria, the overfishing level is equal to 6,200 mt, the average catch for 1978-1995.

OVERVIEW OF APPENDICES

Appendix A: Pacific Halibut Discard Mortality Rates

The report by IPHC staff on the results of analyses of 2001 observer data examining halibut discard mortality rates (DMRs) is included as Appendix A. The report was reviewed in a joint session of the Plan Teams during the November meeting. Following the plan adopted in 2000, halibut bycatch mortality in open access fisheries is managed using a long-term average DMR. IPHC made no recommendations for changes in 2003 from the DMRs used in 2002. The Teams endorse the IPHC recommendations for the CDQ fisheries.

The IPHC recommendations are included in the summary table below. The recommended Preseason Assumed DMRs are based on an average of fishery DMRs during 1990-1999, with the exception of the BSAI hook-&-line fishery for Pacific cod which is based on an average of 1996-1999.

Data for CDQ fisheries were collected in 2001; hook-&-line fishing was directed towards Pacific cod and turbot. Pollock, flathead and yellowfin sole, rockfish, and atka mackerel were targeted by trawls. Pot vessels targeted on cod and sablefish. The DMRs calculated for 2001 for those fisheries were carried forward as recommendations for monitoring in 2003 CDQ targets. The analysis recommends monitoring bycatch mortality in other CDQ targets using the open access DMRs.

Recommendations for Preseason Assumed DMRs for monitoring halibut bycatch mortality in 2003. These represent no change from 2002 for open access fisheries. CDQ values represent data from 2001.

BSAI Target	Recommendations for 2003	GOA Target	Recommendations for 2003
<i>Trawl</i>		<i>Trawl</i>	
Atka mackerel	75	Atka mackerel	70
Bottom pollock	76	Bottom pollock	61
Pacific cod	67	Pacific cod	61
Other Flatfish	71	Deep water flatfish	60
Rockfish	69	Shallow water flatfish	69
Flathead sole	67	Rockfish	69
Other species	67	Flathead sole	58
Pelagic pollock	84	Other species	61
Rock sole	76	Pelagic pollock	72
Sablefish	50	Sablefish	66
Turbot	70	Arrowtooth flounder	62
Yellowfin sole	81	Rex sole	61
<i>Pot</i>		<i>Pot</i>	
Pacific cod	8	Pacific cod	14
Other species	8	Other species	14
<i>Longline</i>		<i>Longline</i>	
Pacific cod	12	Pacific cod	14
Rockfish	25	Rockfish	8
Other species	12	Other species	14
Turbot	18		
<i>CDQ Trawl</i>			
Atka mackerel	80		
Bottom pollock	90		
Pelagic pollock	89		
Flathead sole	90		
Rockfish	90		
Yellowfin sole	83		
<i>CDQ Longline</i>			
Pacific cod	11		
Turbot	4		
<i>CDQ Pot</i>			
Pacific cod	2		
Sablefish	46		

Appendix B: Prohibited Species Catch Summary for Halibut

Information on halibut bycatch in the groundfish fisheries conducted in the Gulf of Alaska (GOA) is provided in Appendix C. It is intended for use by the Council in its utilization of the halibut species bycatch framework measures.

The PSC limits for halibut in the Gulf of Alaska are set by gear type and apportioned seasonally over the fishing year (Amendment 21). For 2002 the Council recommended the following halibut PSC apportionments for the Gulf of Alaska groundfish fisheries:

2002 Trawl		2002 Hook and Line		
Jan 1 - Apr 1	550 mt	1st trimester	Jan 1 - Jun 10	250 mt
Apr 1 -Jul 10	400 mt	2nd trimester	Jun 10 - Sept 1	5 mt
Jul 1 - Sept 1	600 mt	3rd trimester	Sept 1 - Dec 31	35 mt
Sept 1 - Oct 1	150 mt			
Oct 1 - Dec 31	300 mt	DSR	Jan 1- Dec 31	10 mt
TOTAL				300 mt

Bycatch mortality of Pacific halibut in the 2002 Gulf of Alaska groundfish fisheries totaled 2,172 mt for trawl and hook-and-line fisheries through November 2, 2002. Halibut mortality was 1,956 from trawl gear and 227 mt for hook-and-line gear.

Appendix C: Definitions of Common Acronyms

A collection of acronym definitions used in the SAFE has been included as Appendix C.

Appendix D: Echo Integration-Trawl Survey Results for Walleye Pollock in the Gulf of Alaska during 2002

Scientists from the Midwater Assessment and Conservation Engineering (MACE) Program of the Alaska Fisheries Science Center (AFSC) routinely conduct acoustic-trawl surveys in the Gulf of Alaska (GOA) to estimate walleye pollock (*Theragra chalcogramma*) distribution and abundance. Most of the effort has focused on the Shelikof Strait area, which has been surveyed annually since 1980, except in 1982 and 1999. With the exception of surveys in the Shumagin Islands area between 1994 and 1996 and in 2001, surveys outside the Shelikof Strait area have not indicated large amounts of pollock, although these efforts have been restricted temporally and spatially. Results presented here are from the most recent echo integration-trawl (EIT) surveys carried out between 10 and 16 February 2002 in the Shumagin Islands area, including Pavlof Bay and Sanak Trough, and between 12 and 26 March 2002 at three locations around Kodiak Island, including the Shelikof Strait area, the continental shelf break east of Chirikof Island, and Barnabas Trough.

Table 1. Gulf of Alaska groundfish 2002 and 2003 ABCs, 2002 TACs, and 2002 catches reported through November 2, 2002.

SPECIES		ABC (mt) 2003	OFL 2003	ABC (mt) 2002	OFL 2002	TAC 2002	CATCH 2002
Pollock	W (61)	16,788		17,730		17,730	17,381
	C (62)	19,685		23,045		23,045	20,380
	C (63)	10,339		9,850		9,850	10,809
	Shelikof						
	WYAK	1,078	69,410	1,165	75,480	1,165	1,818
	EYAK/SEO	6,460	8,610	6,460	8,610	6,460	2
	TOTAL	54,350	78,020	58,250	84,090	58,250	50,390
Pacific Cod	W	20,600		22,465		16,849	15,327
	C	29,000		31,680		24,790	25,094
	E	3,200		3,455		2,591	103
	TOTAL	52,800	70,100	57,600	72,100	44,230	40,524
Deep water flatfish ¹	W	180		180		180	19
	C	2,220		2,220		2,220	530
	WYAK	1,330		1,330		1,330	2
	EYAK/SEO	1,150		1,150		1,150	7
	TOTAL	4,880	6,430	4,880	6,430	4,880	558
Rex sole	W	1,280		1,280		1,280	398
	C	5,540		5,540		5,540	2,611
	WYAK	1,600		1,600		1,600	0
	EYAK/SEO	1,050		1,050		1,050	0
	TOTAL	9,470	12,320	9,470	12,320	9,470	3,009
Shallow water flatfish ²	W	23,480		23,550		4,500	241
	C	21,740		23,080		13,000	6,599
	WYAK	1,160		1,180		1,180	2
	EYAK/SEO	2,960		1,740		1,740	0
	TOTAL	49,340	61,810	49,550	61,810	20,420	6,842
Flathead sole	W	16,420		9,000		2,000	419
	C	20,820		11,410		5,000	1,689
	WYAK	2,900		1,590		1,590	0
	EYAK/SEO	1,250		690		690	0
	TOTAL	41,390	51,560	22,690	29,530	9,280	2,108
Arrowtooth flounder	W	17,990		16,960		8,000	6,100
	C	113,050		106,580		25,000	14,674
	WYAK	18,190		17,150		2,500	56
	EYAK/SEO	5,910		5,570		2,500	111
	TOTAL	155,140	181,390	146,260	171,060	38,000	20,941
Sablefish	W	2,260		2,240		2,240	1,780
	C	5,670		5,430		5,430	6,120
	WYAK	2,045		1,940		1,940	1,548
	SEO	3,135		3,210		3,210	2,798
	TOTAL	13,110	20,020	12,820	19,350	12,820	12,246
Other Slope rockfish	W	90		90		90	222
	C	550		550		550	481
	WYAK	270		260		150	37
	EYAK/SEO	4,140		4,140		200	31
	TOTAL	5,050	6,610	5,040	6,610	990	771

(Table 1 continued)

SPECIES		ABC (mt) 2003	OFL 2003	ABC (mt) 2002	OFL	TAC (mt) 2002	CATCH 2002
Northern rockfish	W	890		810		810	337
	C	4,640		4,170		4,170	2,998
	E	0 ³				n/a ³	n/a
	TOTAL	5,530	6,560	4,980	5,910	4,980	3,335
Pacific ocean perch	W	2,700	3,220	2,610	3,110	2,610	2,723
	C	8,510	10,120	8,220	9,760	8,220	8,263
	WYAK	810		780		780	748
	SEO	1,640	2,900	1580	2,800	1580	1
	TOTAL	13,660	16,240	13,190	15,670	13,190	11,735
Shortraker/rougheye	W	220		220		220	260
	C	840		840		840	628
	E	560		560		560	403
	TOTAL	1,620	2,340	1,620	2,340	1,620	1,291
Pelagic shelf rockfish	W	510		510		510	183
	C	3,480		3,480		3,480	2,680
	WYAK	640		640		640	448
	EYAK/SEO	860		860		860	7
	TOTAL	5,490	8,220	5,490	8,220	5,490	3,318
Demersal Shelf Rockfish		390	540	350	480	350	182
Atka Mackerel	GW	600	6,200	600	6,200	600	84
Thornyhead rockfish		360		360		360	368
		840		840		840	504
		800		790		790	253
	TOTAL	2,000	3,050	1,990	2,330	1,990	1,125
Other Species	GW	NA		NA	NA	11,330	3,748
TOTAL		414,820	531,410	394,780	504,450	237,890	162,207

1/ Deep water flatfish includes dover sole, Greenland turbot and deepsea sole.

2/ "Shallow water flatfish" includes rock sole, yellowfin sole, butter sole, starry flounder, English sole, Alaska plaice, and sand sole.

3/ The EGOA ABC of 10 mt for northern rockfish has been included in the WYAK ABC for other slope rockfish.

NOTE:

ABCs and TACs are rounded to nearest 10 mt.

GW means Gulfwide.

Catch data source: NMFS Blend Reports.

Table 2. Gulf of Alaska 2003 ABCs, biomass, overfishing levels, and estimated trends (mt)
for Western, Central, Eastern, Gulfwide, West Yakutat, and Southeast Outside regulatory areas.

		2003			Abundance, ² Trend
SPECIES		ABC	Biomass	Overfishing Level	
Pollock	W (61)	16,788			Below, Declining
	C (62)	19,685			
	C (63)	10,339			
	WYAK	1,078	670,410	69,410	
	EYAK/SEO	6,460	28,710	8,610	
	TOTAL	54,350	699,120	78,020	
Pacific Cod	W	20,600			Below, Declining
	C	29,000			
	E	3,200			
	TOTAL	52,800	452,000	70,100	
Deep water flatfish	W	180			Unknown, Unknown
	C	2,220			
	WYAK	1,330			
	EYAK/SEO	1,150			
	TOTAL	4,880	68,260 ⁴	6,430	
Rex sole	W	1,280			Unknown, ³ Stable
	C	5,540			
	WYAK	1,600			
	EYAK/SEO	1,050			
	TOTAL	9,470	71,330	12,320	
Shallow water flatfish	W	23,480			Unknown, ³ Stable
	C	21,740			
	WYAK	1,160			
	EYAK/SEO	2,960			
	TOTAL	49,340	349,990	61,810	
Flathead sole	W	16,420			Above, Declining
	C	20,820			
	WYAK	2,900			
	EYAK/SEO	1,250			
	TOTAL	41,390	132,260	51,560	
Arrowtooth flounder	W	17,990			Above, Increasing
	C	113,050			
	WYAK	18,190			
	EYAK/SEO	5,910			
	TOTAL	155,140	1,302,000	181,390	
Sablefish	W	2,260			Moderate, Increasing
	C	5,670			
	WYAK	2,045			
	EY/SEO	3,135			
	TOTAL	13,110	182,000	20,020	
Other Slope rockfish	W	90			Unknown, Unknown
	C	550			
	WYAK	270 ¹			
	EYAK/SEO	4,140			
	TOTAL	5,050	107,960	6,610	

(Table 2 continued)

		2003			
SPECIES		ABC	Biomass	Overfishing Level	Abundance, ² Trend
Northern rockfish	W	890			Above, Declining
	C	4,640			
	E	0 ¹			
	TOTAL	5,530	108,830	6,590	
Pacific ocean perch	W	2,700		3,220	Above, Increasing
	C	8,510		10,120	
	WYAK	810			
	EY/SEO	1,640		2,900	
	TOTAL	13,660	298,820	16,240	
Shortraker/ rougheye	W	220			Unknown, Unknown
	C	840			
	E	560			
	TOTAL	1,620	66,830	2,340	
Pelagic shelf rockfish	W	510			Unknown, Unknown
	C	3,480			
	WYAK	640			
	EY/SEO	860			
	TOTAL	5,490	62,500	8,220	
Demersal shelf rockfish	SEO	390	17,510	540	Unknown, Unknown
Atka mackerel	GW	600	Unknown	6,200	Unkown, Unknown
Thornyhead rockfish	Western	360			Above, Stable
	Central	840			
	Eastern	800			
	Total	2,000	85,760	3,050	
Other species					TAC = 5% of the sum of TACs.
TOTAL		414,820	4,005,170	531,440	

1/ The EGOA ABC of 10 mt for northern rockfish has been included in the WYAK ABC for other slope rockfish.

2/ Abundance relative to target stock size as specified in SAFE documents.

3/ Historically lightly exploited therefore expected to be above the specified reference point.

4/ Biomass of Dover sole; biomass of Greenland turbot and deep-sea sole is unknown.

NOTE:

ABCs are rounded to nearest 10.

Overfishing is defined Gulf-wide, except for pollock and POP.

Table 3. Summary of fishing mortality rates and overfishing levels for the Gulf of Alaska, 2003.

Species	Tier	F_{ABC}^1	Strategy	F_{OFL}^2	Strategy
Pollock	3b	0.14	F_{ABC}	0.20	$F_{35\%}$ adjusted
Pacific cod	3b	0.30	F_{ABC}	0.41	$F_{35\%}$ adjusted
Deepwater flatfish	5,6 ³	0.075	F_{ABC}^3	0.10	F_{OFL}^4
Rex sole	5	0.15	$F=0.75M$	0.20	$F=M$
Flathead sole	3a	0.417	$F_{40\%}$	0.546	$F_{35\%}$
Shallow water flatfish	4,5 ⁵	0.15-0.20	$F=0.75M$, $F_{40\%}^5$	0.192-0.245	$F_{35\%}$, $F=M^6$
Arrowtooth	3a	0.140	$F_{40\%}$	0.165	$F_{35\%}$
Sablefish	3b	0.081	F_{ABC}	0.164	$F_{35\%}$ adjusted
Pacific ocean perch	3a	0.050	$F_{40\%}$	0.060	$F_{35\%}$
Shortraker/rougheye	4,5 ⁷	0.023/0.025	$F=.75M$, $F=M^7$	0.03/.038	$F=M$, $F_{35\%}^8$
Rockfish (other slope)	4,5 ⁹	0.03-0.75	$F=.75M$, $F=M^9$	0.04-0.10	$F_{35\%}$, $F=M^{10}$
Northern rockfish	3a	0.056	$F_{40\%}$	0.066	$F_{35\%}$
Pelagic Shelf Rockfish	4,5 ¹¹	0.068-0.09	$F=.75M$, $F=M^{11}$	0.09-0.136	$F_{35\%}$, $F=M^{12}$
Demersal Shelf Rockfish	4	0.02	$F=M$	0.028	$F_{35\%}$
Thornyhead rockfish	3a	0.067	F_{ABC}	0.102	$F_{35\%}$
Atka mackerel	6	NA	F_{ABC}^{13}	NA	F_{OFL}^{14}

- 1/ Fishing mortality rate corresponding to acceptable biological catch.
- 2/ Maximum fishing mortality rate allowable under overfishing definition.
- 3/ $F_{ABC}=.75M$ for Dover sole (Tier 5), $ABC=.75 \times$ average catch (1978-1995) for other deepwater flatfish (Tier 6).
- 4/ $F=M$ for Dover sole, average catch (1978-1995) for other deepwater flatfish.
- 5/ $F_{40\%}$ for rocksole (Tier 4), $F=.75M$ for remaining shallowwater flatfish (Tier 5).
- 6/ $F_{35\%}$ for rocksole (Tier 4), $F=M$ for remaining shallowwater flatfish (Tier 5).
- 7/ $F=.75M$ for shortraker (Tier 5), $F=M$ for rougheye (Tier 4).
- 8/ $F=M$ for shortraker, $F_{35\%}$ for rougheye.
- 9/ $F=M$ for sharpchin rockfish (Tier 4), $F=.75M$ for other species (Tier 5).
- 10/ $F_{35\%}$ for sharpchin, $F=M$ for other species.
- 11/ $F=M$ for dusky rockfish (Tier 4), $F=.75M$ for widow and yellowtail rockfish (Tier 5).
- 12/ $F_{35\%}$ for dusky rockfish, $F=M$ for widow and yellowtail rockfish.
- 13/ ABC for Atka mackerel is 600 mt for bycatch in other target fisheries.
- 14/ OFL for Atka mackerel is equal to average catch from 1978 to 1995.

Table 4. Maximum permissible fishing mortality rates and ABCs as defined in Amendment 56 to the GOA and BSAI Groundfish FMPs, and the 2003 Plan Team recommended fishing mortality rates and ABCs, for those species whose recommendations were below the maximum.

Gulf of Alaska

Species	Tier	2003	2003	2003	2003
		Max. Permissible F_{ABC}	Max. Permissible ABC	F_{ABC}	ABC
Pollock	3b	0.17	59,200	0.14	49,600
Pacific cod	3b	0.34	59,900	0.30	52,800
Sablefish	3b	0.129	18,100	0.081	13,110
Rougheye rockfish	4	0.032	1,320	0.025	1,030
Shortraker rockfish	5	0.023	590	0.023	590
Total Shortraker/Rougheye	4,5		1,910		1,620
Other slope rockfish (sharpchin)	4	0.053	2,110	0.050	1,990
Other slope rockfish (redstripe)	5	0.075	1,020	0.075	1,020
Other slope rockfish (harlequin)	5	0.045	660	0.045	660
Other slope rockfish (silvergrey)	5	0.030	850	0.030	850
Other slope rockfish (redbanded)	5	0.045	330	0.045	330
Other slope rockfish (minor species)	5	0.045	190	0.045	190
Total other slope rockfish	4,5		5160		5,040
Dusky rockfish	4	0.110	6,200	0.090	5,070
Widow and Yellowtail rockfish	5	0.068	420	0.068	420
Total Pelagic shelf rockfish	4,5		6,620		5,490
Thornyhead rockfish	3a	0.085	2,555	0.067	2,000
Demersal shelf rockfish	4	0.025	470	0.020	390
Atka mackerel	6	NA	4,700	NA	600

Table 5. Groundfish landings (metric tons) in the Gulf of Alaska, 1956-2001.

Year	Pollock	Pacific Cod	Flat Fish	Arrowtooth Flounder	Sable Fish	Slope Rock Fish ^a
1956					1,391	
1957					2,759	
1958					797	
1959					1,101	
1960					2,142	
1961					897	16,000
1962					731	65,000
1963					2,809	136,300
1964	1,126	196	1,028		2,457	243,385
1965	2,749	599	4,727		3,458	348,598
1966	8,932	1,376	4,937		5,178	200,749
1967	6,276	2,225	4,552		6,143	120,010
1968	6,164	1,046	3,393		15,049	100,170
1969	17,553	1,335	2,630		19,376	72,439
1970	9,343	1,805	3,772		25,145	44,918
1971	9,458	523	2,370		25,630	77,777
1972	34,081	3,513	8,954		37,502	74,718
1973	36,836	5,963	20,013		28,693	52,973
1974	61,880	5,182	9,766		28,335	47,980
1975	59,512	6,745	5,532		26,095	44,131
1976	86,527	6,764	6,089		27,733	46,968
1977	112,089	2,267	16,722		17,140	23,453
1978	90,822	12,190	15,198		8,866	8,176
1979	98,508	14,904	13,928		10,350	9,921
1980	110,100	35,345	15,846		8,543	12,471
1981	139,168	36,131	14,864		9,917	12,184
1982	168,693	29,465	9,278		8,556	7,991
1983	215,567	36,540	12,662		9,002	7,405
1984	307,400	23,896	6,914		10,230	4,452
1985	284,823	14,428	3,078		12,479	1,087
1986	93,567	25,012	2,551		21,614	2,981
1987	69,536	32,939	9,925		26,325	4,981
1988	65,625	33,802	10,275		29,903	13,779
1989	78,220	43,293	11,111		29,842	19,002
1990	90,490	72,517	15,411		25,701	21,114
1991	107,500	76,997	20,068		19,580	13,994
1992	93,904	80,100	28,009		20,451	16,910
1993	108,591	55,994	37,853		22,671	14,240
1994	110,891	47,985	29,958		21,338	11,266
1995	73,248	69,053	32,273		18,631	15,023
1996	50,206	67,966	19,838	22,183	15,826	14,288
1997	89,892	68,474	17,179	16,319	14,129	15,304
1998	123,751	62,101	11,263 ¹	12,974	12,758	14,402
1999	95,637	68,613	8,821	16,209	13,918	18,057
2000	71,876	54,492	13,052	24,252	13,779	15,683
2001	70,485 ^J	41,614 ^J	11,817	19,964	12,127	16,479
2002/h	50,390 ^J	40,524 ^J	12,517	20,941	12,246	17,132

a/ Catch defined as follows: (1) 1961-78, Pacific ocean perch (*S. alutus*) only; (2) 1979-1987, the 5 species of the Pacific ocean perch complex; 1988-90, the 18 species of the slope rock assemblage; 1991-1995, the 20 species of the slope rockfish assemblage.

b/ Catch from Southeast Outside District.

c/ Thornyheads were included in the other species category, and are foreign catches only.

d/ After numerous changes, the other species category was stabilized in 1981 to include sharks, skates, sculpins, eulachon, capelin (and other smelts in the family Osmeridae and octopus. Atka mackerel and squid were added in 1989. Catch of Atka Mackerel is reported separately for 1990-1992; thereafter Atka mackerel was assigned a separate target species.

Table 5. (continued)						
Year	Pelagic Shelf Rockfish	Demersal Shelf Rockfish ^b	Thorny Heads ^c	Atka Mackerel ^e	Other Species ^d	Total All Species
1956						1,391
1957						2,759
1958						797
1959						1,101
1960						2,142
1961						16,897
1962						65,731
1963						139,109
1964						248,192
1965						360,131
1966						221,172
1967						139,206
1968						125,822
1969						113,333
1970						84,983
1971						115,758
1972						158,768
1973						144,478
1974						153,143
1975						142,015
1976						174,081
1977			0	19,455	4,642	195,768
1978			0	19,588	5,990	160,830
1979			0	10,949	4,115	162,675
1980			1,351	13,166	5,604	202,426
1981			1,340	18,727	7,145	239,476
1982		120	788	6,760	2,350	234,001
1983		176	730	12,260	2,646	296,988
1984		563	207	1,153	1,844	356,659
1985		489	81	1,848	2,343	320,656
1986		491	862	4	401	147,483
1987		778	1,965	1	253	146,703
1988	1,086	508	2,786	-	647	158,411
1989	1,739	431	3,055	-	1,560	188,253
1990	1,647	360	1,646	1,416	6,289	236,591
1991	2,342	323	2,018	3,258	1,577	247,657
1992	3,440	511	2,020	13,834	2,515	261,694
1993	3,193	558	1,369	5,146	6,867	256,482
1994	2,990 ^f	540	1,320	3,538	2,752	232,578
1995	2,891	219 ^g	1,113	701	3,433	216,585
1996	2,302	401	1,100	1,580	4,302	199,992
1997	2,629	406	1,240	331	5,409	231,312
1998	3,111	552	1,136	317	3,748	246,113
1999	4,826	297	1,282	262	3,858	231,780
2000	3,730	406	1,307	170	5,649	204,396
2001	3,008	301	1,339	76	4,801	182,011
2002	3,318	182	1,125	84	3,748	162,213

e/ Atka mackerel was added to the Other Species category in 1988 and separated out in 1994.

f/ PSR includes light dusky rockfish, black rockfish, yellowtail rockfish, widow rockfish, dark dusky rockfish, and blue rockfish.

g/ Does not include at-sea discards.

h/ Catch data reported through November 2, 2002.

i/ Includes all species except arrowtooth.

j/ Does not include state fisheries

Since 1999 other species includes sculpins, sharks, skates, squid and octopus.

Eulachon and capelin were moved into a forage fish category.

Figure 1. GOA Statistical and Reporting Areas

GOA Statistical and Reporting Areas

